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Supramolecular nanoscale systems based on amphiphilic tetramethylensulfonatocalix[4]resorcinarenes and cationic polyelectrolyte with controlled guest molecule binding

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Abstract

© 2016 Informa UK Limited, trading as Taylor & Francis GroupThe water-soluble tetramethylensulfonatocalix[4]resorcinarene with methyl (C1) and pentyl (C5) substitutes on the lower rim forms colloid nanoscale aggregates with poly(diallyldimethylammonium chloride) (PDDA) in aqueous solutions. The size and stability of nanoparticles depend on concentrations of the components and their ratio in the 'calixarene-polymer' system. Ternary supramolecular complexes «polymer–macrocycle–guest molecule L-tryptophan (Trp) in conditions of spontaneous pH (3.80 and 4.78 for C1-PDDA and C5-PDDA systems, respectively) in an aqueous solution and in phosphate buffer (pH 7) were investigated by fluorescence method. The addition of the third component – PDDA – to the «non-aggregated C1–Trp» associates leads to the release of Trp in all studied conditions. The possibility of the «binding–release» process of L-tryptophan in «C5–Trp» associates after PDDA addition in the ternary complex is achieved and controlled by the structure of the macrocyclic self-associates and pH conditions.

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Keywords

calix[4]resorcinarene, fluorescence, L-tryptophan, nanoscale aggregates, Supramolecular complex polymer-macrocycle